

PRELIMINARY DATA SUMMARY

October 1992

U.S. Army Engineer Waterways Experiment Station
Coastal Engineering Research Center
Field Research Facility
Duck, North Carolina

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CERC Field Research Facility
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Measurements and Analysis work units at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

CONTENTS

	<u>Page</u>
TABLE OF CONTENTS.....	1
PART I: INTRODUCTION.....	2
PART II: METEOROLOGICAL DATA.....	6
PART III: WAVE DATA.....	9
PART IV: CURRENT DATA.....	13
PART V: SUPPLEMENTAL OBSERVATIONS.....	21
PART VI: WATER LEVELS.....	23
PART VII: NEARSHORE PROFILES AND BATHYMETRY.....	26
PART VIII: SPECIAL EVENTS.....	29

LIST OF FIGURES

<u>No.</u>		<u>Page</u>
1	FRF location map.....	3
2	Instrument locations at FRF.....	5
3	Time history of wave heights and periods.....	12
4	Water level time history	24
5	CRAB profiles.....	26
6	CRAB profile envelope.....	27
7	FRF bathymetry (26 October 92).....	28

LIST OF TABLES

<u>No.</u>		<u>Page</u>
1	Instrument Status/Data Availability.....	4
2	Meteorological Data.....	7
3	Wave Data.....	10
4	Current Data.....	14
5	Supplemental Observations.....	22
6	Water Levels.....	25

PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height of 7.6 m above the National Geodetic Vertical Datum (NGVD) of the year 1929. In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Clifford F. Baron at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

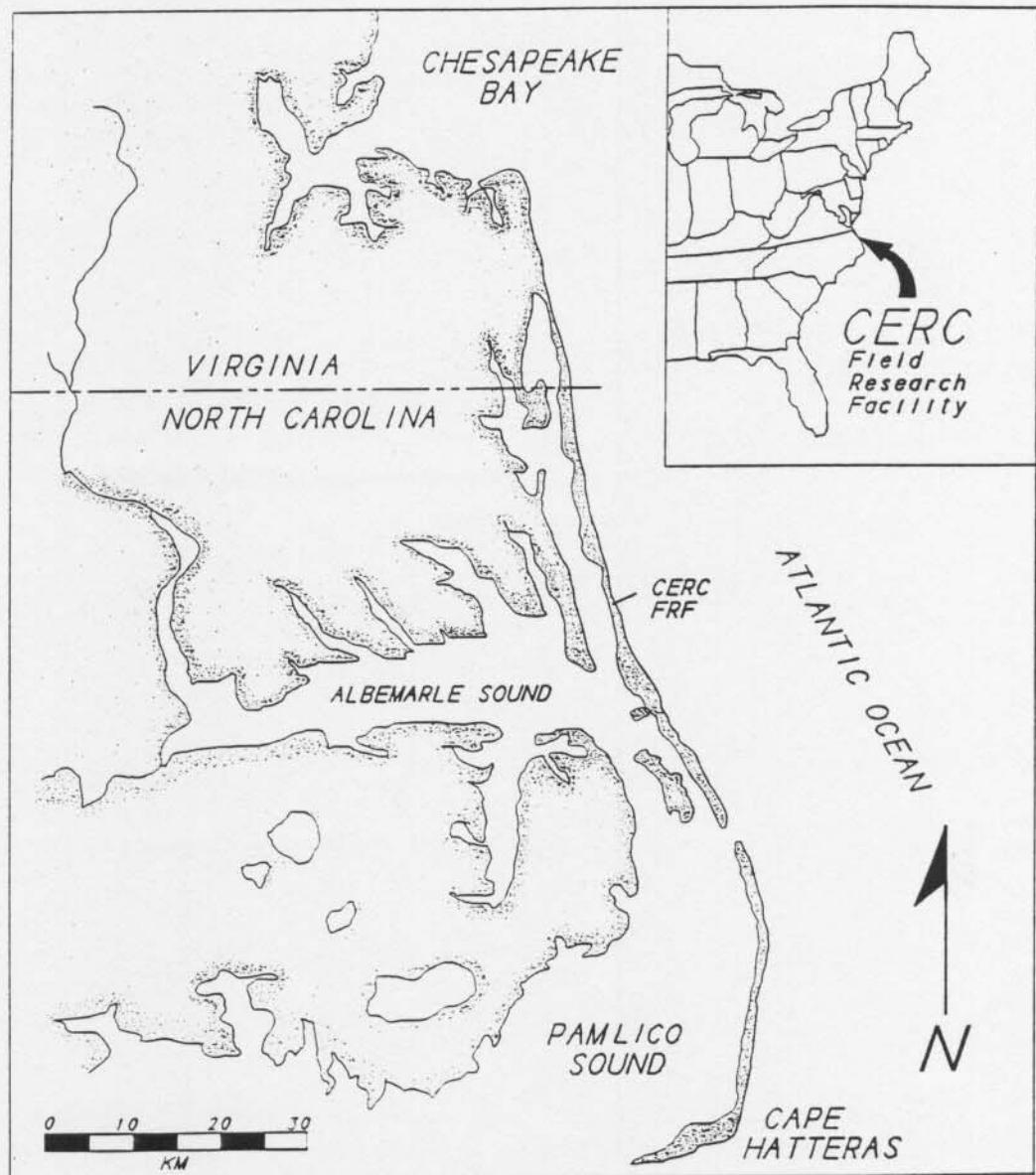


Figure 1. FRF Location Map

Table 1: Instrument Status/Data Availability

OCTOBER 1992

Gage ID	Description/Remarks	Depth at Sensor		Day of the month																																	
				1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1			
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
932	Anemometer at seaward end of pier Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
625	Baylor staff at station 18+60 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
630	Waverider buoy 4.0 km offshore	Approx. 17 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
519	Current meter 320 m north of FRF pier (0.9 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Supplemental Observations (daily oceanographic and meteorological observations)		Daily observation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Gage Status

Operational = *

Partial = /

Non-Operational = -

Daily Observation

Complete = *

Partial = /

None = -

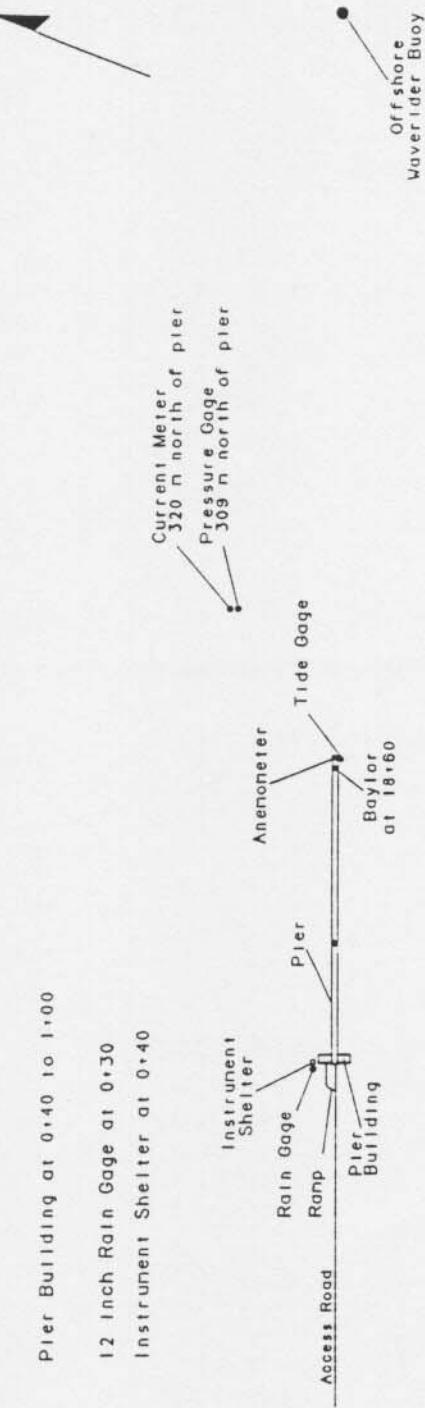
Data Collected

All = *

Partial = /

None = -

True North



CURRI TUCK SOUND

ATLANTIC OCEAN

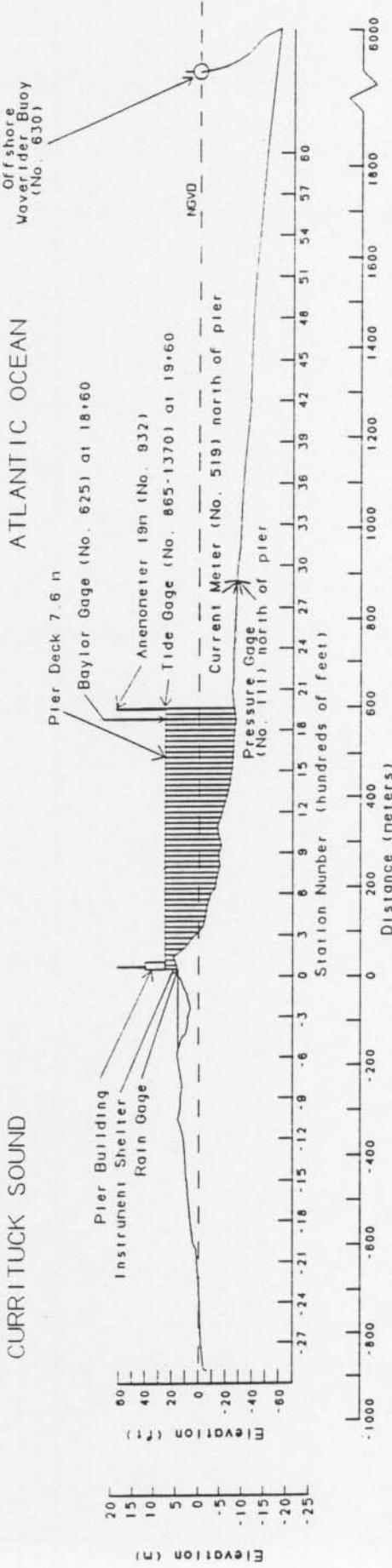


Figure 2. Instrument locations at FRF (all elevations from NGVD, all distances from FRF baseline).

PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

Winds were measured at the end of the pier at an elevation of 19 m (Figure 2) using a WeatherMeasure Skyyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Wind directions indicate where the wind is coming from. Temperature and atmospheric pressure means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -
 $mm \times .03937 = in.$
2. Millibars (mb) to inches of mercury (in. Hg) -
 $mb \times 0.02953 = in. Hg$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -
 $m/s \times 1.943 = kn$

Table 2: Meteorological Data

Oct 1992

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
1	100	11	12	14.6	1018.4	0
	700	7	316	12.4	1019.8	0
	1300	10	2	14.4	1019.7	0
	1900	5	350	12.8	1019.3	0
2	100	4	287	11.9	1018.7	0
	700	7	306	11.8	1019.0	0
	1300	3	96	18.5	1017.8	0
	1900	4	186	14.3	1017.0	0
3	100	3	211	13.7	1016.0	0
	700	2	229	15.8	1016.8	0
	1300	4	175	22.3	1014.7	0
	1900	5	185	18.7	1013.9	0
4	100	4	191	19.0	1013.1	0
	700	4	82	20.1	1012.5	0
	1300	11	38	18.1	1009.0	7
	1900	17	36	17.7	1005.1	11
5	100	17	34	17.7	1005.1	0
	700	18	26	16.7	1008.4	0
	1300	16	24	15.9	1012.9	0
	1900	15	28	14.0	1016.6	0
6	100	13	30	14.5	1019.0	0
	700	12	35	14.9	1021.9	0
	1300	11	27	16.2	1022.6	0
	1900	10	45	15.0	1023.3	0
7	100	9	55	16.0	1023.2	0
	700	8	63	17.1	1023.5	0
	1300	7	55	18.4	1023.2	0
	1900	7	55	16.9	1022.1	0
8	100	7	68	17.6	1021.4	0
	700	7	77	18.6	1022.1	0
	1300	8	73	20.0	1020.8	0
	1900	6	102	18.9	1019.9	0
9	100	6	159	19.6	1018.3	0
	700	7	156	19.7	1016.7	0
	1300	10	174	23.1	1014.6	0
	1900	4	178	21.1	1013.4	0
10	100	0		19.6	1013.4	0
	700	1	235	23.1	1013.3	0
	1300	4	22	20.7	1012.5	0
	1900	3	47	19.2	1012.5	0
11	100	2	195	19.1	1010.6	0
	700	3	245	17.9	1010.2	0
	1300	4	215	19.6	1008.1	0
	1900	4	250	21.6	1008.4	0
12	100	6	320	17.6	1009.1	0
	700	5	321	15.5	1010.7	0
	1300	2	280	19.1	1009.8	0
	1900	3	257	16.8	1010.0	0
13	100	5	222	15.6	1011.1	0
	700	5	256	15.5	1012.2	0
	1300	4	232	20.4	1012.0	0
	1900	3	219	17.7	1014.1	0
14	100	3	243	16.8	1016.1	0
	700	3	250	16.9	1019.2	0
	1300		Hardware Error		0	0
	1900	7	200	19.8	1019.1	0
15	100	5	213	17.6	1020.0	0
	700	5	220	18.0	1021.4	0
	1300	6	216	24.5	1020.0	0
	1900	7	195	20.3	1019.8	0
16	100	6	208	19.4	1019.2	0
	700	4	198	19.5	1018.3	0
	1300	7	179	24.9	1015.7	0
	1900	7	177	20.0	1013.7	0

* electronic problems

(Continued)

(Sheet 1 of 2)

Table 2: Meteorological Data

Oct 1992

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation
		Speed m/sec	Direction deg TN	deg C	mb	mm
17	100	5	227	19.5	1012.7	0
	700	15	359	14.8	1016.5	0
	1300	12	355	14.1	1018.0	0
	1900	9	5	12.7	1019.4	0
18	100	9	30	13.4	1019.0	0
	700	10	39	14.0	1018.7	0
	1300	9	41	15.5	1016.1	0
	1900	10	19	14.6	1013.5	0
19	100	7	310	11.3	1012.3	0
	700	9	304	9.0	1014.7	0
	1300	12	323	11.1	1017.1	0
	1900	8	326	8.4	1021.9	0
20	100	9	319	6.8	1024.4	0
	700	5	310	5.8	1027.3	0
	1300	2	45	11.3	1027.6	0
	1900	4	186	8.6	1027.3	0
21	100	5	203	10.7	1026.5	0
	700	3	209	12.2	1027.0	0
	1300	6	255	18.1	1024.5	0
	1900	4	274	14.7	1025.1	0
22	100	4	264	13.0	1025.5	0
	700	9	33	15.1	1028.2	0
	1300	10	359	14.5	1028.9	0
	1900	8	21	13.7	1028.3	0
23	100	8	44	13.7	1028.2	0
	700	8	36	13.2	1027.5	0
	1300	5	1	14.6	1025.2	0
	1900	3	33	13.3	1022.6	0
24	100	2	288	10.0	1019.0	0
	700	2	226	12.6	1016.7	0
	1300	5	217	17.7	1010.1	0
	1900	9	207	14.6	1006.5	0
25	100	5	278	15.8	1005.3	0
	700	11	326	11.4	1007.8	0
	1300	8	338	14.2	1007.3	0
	1900	3	294	10.9	1009.6	0
26	100	5	327	9.9	1011.3	0
	700	3	305	10.0	1013.2	0
	1300	5	235	15.5	1011.3	0
	1900	5	192	13.6	1010.9	0
27	100	7	229	13.7	1010.8	0
	700	3	1	13.9	1011.3	0
	1300	3	30	17.4	1010.8	0
	1900	4	73	15.8	1011.2	0
28	100	4	90	16.6	1010.9	0
	700	5	119	16.9	1011.1	0
	1300	3	51	19.1	1009.9	0
	1900	3	37	17.2	1010.3	0
29	100	3	19	17.4	1010.7	0
	700	2	76	18.1	1011.6	0
	1300	3	43	18.6	1010.7	0
	1900	2	32	16.1	1010.5	0
30	100	0		15.2	1010.9	0
	700	0		15.9	1013.1	0
	1300	3	78	15.9	1012.5	0
	1900	5	94	16.0	1013.2	0
31	100	3	1	18.2	1010.3	0
	700	9	41	18.1	1010.4	8
	1300	11	5	17.9	1011.7	5
	1900	10	358	16.0	1015.8	0
		Resultant		Mean	Mean	Total
		2	11	16.0	1016.1	31

* electronic problems

(Sheet 2 of 2)

PART III: WAVE DATA

Wave data are collected from a Baylor staff gage (Gage 625), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on optical disc using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 3 hr. The sampling rate is two times per second for five contiguous 34-min records. This report reflects the data collection periods of 0100, 0700, 1300, and 1900 EST. The results are based only on the first 34 minute record.

Wave height H_{mo} is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period T_p is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to optical disc.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all H_{mo} and T_p values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, the presence of multiple wave trains containing nearly equal energy, and statistical variations in spectral estimations.

Table 3: Wave Data

Oct 1992

Day	Hour	625		111		630	
		Baylor	at 18+60	Pressure	Gage	Offshr	Wvrdr
1	0100	1.43	6.40	1.60	5.95	1.70	6.09
	0700	1.37	6.92	1.50	7.11	1.71	6.56
	1300	1.32	6.24	1.52	6.56	1.61	6.56
	1900	1.05	6.92	1.16	7.11	1.27	6.56
2	0100	0.74	6.09	0.84	5.22	0.95	6.74
	0700	0.69	7.31	0.75	7.31	0.86	7.31
	1300	0.65	6.92	0.73	9.85	0.75	11.64
	1900	0.59	11.13	0.63	11.64	0.67	11.13
3	0100	0.45	10.67	0.57	10.67	0.60	11.13
	0700	0.45	10.67	0.54	11.13	0.67	9.85
	1300	0.39	10.67	0.44	11.13	0.51	11.13
	1900	0.39	10.67	0.45	10.67	0.50	10.67
4	0100	0.35	11.13	0.43	11.13	0.44	10.67
	0700	0.42	10.67	0.45	10.67	0.45	10.67
	1300	0.89	3.77	0.91	3.82	1.07	3.94
	1900	1.80	6.09	2.04	5.82	2.25	5.82
5	0100	3.02	8.53	3.82	8.83	4.15	8.26
	0700	2.90	8.83	3.66	8.53	3.94	8.26
	1300	3.00	10.24	3.81	10.67	4.10	9.85
	1900	2.76	10.67	3.40	11.13	3.64	11.13
6	0100	2.56	7.76	2.93	9.48	3.20	10.67
	0700	2.17	10.24	2.30	10.67	2.59	10.24
	1300	1.82	9.85	2.06	9.85	2.43	10.67
	1900	1.91	10.24	2.18	10.24	2.23	10.67
7	0100	1.74	10.67	1.89	10.67	2.05	8.26
	0700	1.42	11.13	1.57	11.13	1.62	11.13
	1300	1.41	11.64	1.55	10.67	1.57	11.13
	1900	1.19	11.64	1.32	11.13	1.41	10.67
8	0100	1.14	11.64	1.18	9.85	1.34	10.24
	0700	1.09	12.19	1.13	10.24	1.29	11.13
	1300	1.11	11.13	1.12	11.64	1.26	11.13
	1900	1.02	11.13	1.07	11.13	1.15	11.64
9	0100	1.01	11.64	1.09	12.19	1.11	12.19
	0700	1.10	12.19	1.28	11.64	1.34	12.19
	1300	1.24	12.80	1.33	12.80	1.39	6.56
	1900	1.22	8.00	1.36	8.00	1.50	7.76
10	0100	1.12	8.83	1.31	8.53	1.43	8.26
	0700	1.22	9.85	1.47	9.85	1.62	9.85
	1300	1.20	9.85	1.26	9.85	1.31	9.85
	1900	1.01	8.83	1.11	8.83	1.30	8.53
11	0100	0.94	8.53	1.02	8.83	1.15	8.83
	0700	0.75	8.26	0.79	8.83	0.94	8.00
	1300	0.63	8.53	0.64	8.26	0.76	8.26
	1900	0.57	8.53	0.64	7.11	0.75	7.76
12	0100	0.53	8.53	0.56	8.00	0.73	8.00
	0700	0.95	5.33	1.04	5.33	1.22	5.22
	1300	0.66	5.02	0.67	5.12	0.84	5.69
	1900	0.54	5.45	0.59	5.57	0.65	5.82
13	0100	0.38	7.76	0.40	8.83	0.50	7.76
	0700	0.30	7.53	0.34	7.31	0.37	8.26
	1300	0.32	10.24	0.36	8.83	0.35	11.64
	1900	0.33	7.76	0.37	7.76	0.40	10.24
14	0100	0.31	7.53	0.37	9.14	0.38	8.53
	0700	0.31	8.53	0.35	10.24	0.37	8.83
	1300						
	1900	0.41	9.48	0.38	9.48	0.55	8.53
15	0100	0.33	9.85	0.35	8.53	0.39	8.26
	0700	0.32	9.14	0.37	9.14	0.42	8.53
	1300	0.36	8.53	0.38	9.48	0.44	7.76
	1900	0.38	9.14	0.36	8.53	0.45	8.53
16	0100	0.30	9.14	0.29	8.83	0.38	9.48
	0700	0.28	8.26	0.28	8.26	0.33	8.26
	1300	0.27	8.53	0.29	8.26	0.31	8.53
	1900	0.28	8.53	0.29	12.80	0.37	8.53

* Electronic problems

(Continued)

(Sheet 1 of 2)

Table 3: Wave Data

Oct 1992

Day	Hour	625		111		630	
		Baylor	at 18+60	Pressure	Gage	Offshsr	Wvrdr
17	0100	0.37	5.45	0.41	5.45	0.56	5.22
	0700	1.50	5.82	1.80	5.57	2.30	5.69
	1300	1.51	7.31	1.54	7.31	1.79	6.74
	1900	1.22	6.09	1.36	6.09	1.65	6.92
18	0100	1.11	4.27	1.16	4.57	1.27	5.82
	0700	1.23	5.45	1.26	5.22	1.39	5.69
	1300	1.24	5.69	1.24	5.69	1.51	5.95
	1900	1.32	5.82	1.37	5.69	1.65	5.95
19	0100	1.34	6.92	1.57	6.74	1.70	7.11
	0700	1.03	9.48	1.13	9.48	1.26	9.14
	1300	1.10	6.24	1.23	6.24	1.71	6.09
	1900	1.30	6.40	1.43	6.40	1.69	6.74
20	0100	1.40	6.74	1.51	6.56	1.68	6.74
	0700	1.21	10.67	1.27	10.67	1.32	10.67
	1300	1.04	10.67	1.27	10.24	1.22	10.24
	1900	1.18	11.64	1.24	11.64	1.23	11.64
21	0100	1.03	11.64	1.12	11.64	1.17	10.67
	0700	0.84	11.13	0.89	10.67	0.96	11.13
	1300	0.69	10.67	0.75	10.67	0.75	10.67
	1900	0.65	9.85	0.70	10.24	0.75	10.67
22	0100	0.61	9.48	0.66	9.85	0.70	8.83
	0700	1.21	4.83	1.32	4.66	1.34	4.92
	1300	1.24	4.83	1.40	5.02	1.45	5.57
	1900	1.14	5.95	1.15	5.95	1.33	6.09
23	0100	1.11	5.69	1.15	5.82	1.29	5.95
	0700	1.17	6.40	1.23	6.24	1.35	5.57
	1300	1.07	6.24	1.11	8.53	1.25	6.56
	1900	0.86	9.48	0.92	9.14	1.01	9.48
24	0100	0.89	9.48	0.96	8.53	0.98	8.26
	0700	0.78	7.76	0.88	9.14	0.93	8.53
	1300	0.75	10.24	0.82	9.85	0.92	9.85
	1900	0.77	9.48	0.90	9.85	1.01	9.48
25	0100	0.73	9.48	0.82	12.19	1.01	12.80
	0700	1.21	11.64	1.37	11.64	1.59	5.95
	1300	1.30	6.40	1.56	6.40	1.63	6.56
	1900	1.16	14.22	1.29	13.47	1.47	12.80
26	0100	1.08	13.47	1.18	13.47	1.17	13.47
	0700	1.05	13.47	1.05	12.80	1.17	13.47
	1300	0.81	12.80	0.87	7.31	0.95	11.64
	1900	0.63	11.64	0.74	12.80	0.76	7.11
27	0100	0.34	12.19	0.36	12.80	0.49	12.19
	0700	0.25	12.19	0.30	12.19	0.29	12.19
	1300	0.25	12.19	0.30	11.64	0.33	11.64
	1900	0.39	11.64	0.29	12.19	0.46	11.64
28	0100	0.61	4.83	0.55	4.27	0.61	4.92
	0700	0.66	4.92	0.64	4.49	0.74	4.92
	1300	0.56	4.34	0.52	12.19	0.61	12.19
	1900	0.47	11.13	0.47	4.83	0.58	4.34
29	0100	0.46	11.13	0.44	4.41	0.51	5.82
	0700	0.41	16.00	0.43	10.24	0.48	5.82
	1300	0.38	10.24	0.40	16.00	0.45	16.00
	1900	0.49	15.06	0.45	16.00	0.57	9.85
30	0100	0.40	15.06	0.46	15.06	0.51	15.06
	0700	0.52	14.22	0.55	15.06	0.58	13.47
	1300	0.56	14.22	0.61	13.47	0.63	12.19
	1900	0.67	12.80	0.61	14.22	0.70	13.47
31	0100	0.74	14.22	0.76	13.47	0.84	13.47
	0700	1.00	4.83	1.09	4.41	1.11	4.74
	1300	1.36	6.92	1.44	6.74	1.57	6.92
	1900	1.79	8.00	1.96	7.76	2.09	7.31
Mean		0.95	9.18	1.04	9.18	1.16	8.93
Std dev		0.58	2.70	0.70	2.77	0.75	2.56

* Electronic problems

(Sheet 2 of 2)

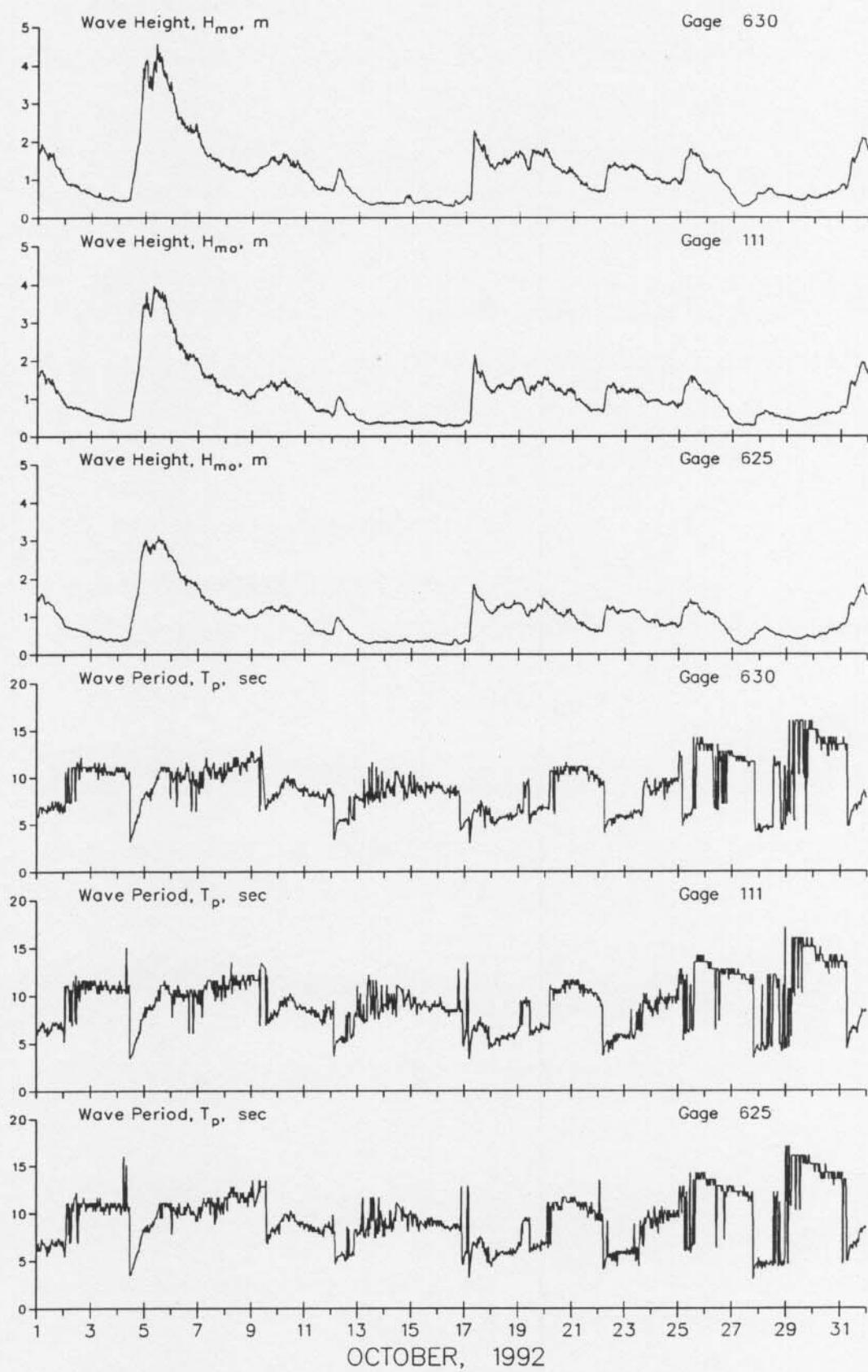


Figure 3. Time history of wave heights and periods

PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the cross-shore and longshore data. Current directions indicate the direction that the current is moving towards.

IMPORTANT NOTE

Direction resultants regarding the current meter data (gages 519 and 529) may be in error by minus 5 degrees due to a faulty compass reading. Please call us if you must use this data.

Table 4: Current Data
Oct 1992

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter	
		Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519
1	0100-Along Cross Result									46
	Time	Speed	Dir							12
										48
1	0700-Along Cross Result	34	S on	140	102 0	S	North	82	S	36
		5			102	160				7
		34	169							37
1	1300-Along Cross Result									43
										12
										44
1	1900-Along Cross Result									22
										2
										22
2	0100-Along Cross Result									14
										7
										16
2	0700-Along Cross Result	15	S off	140	68 3	S on	South	8	S	9
		1			68	163				7
		15	157							12
2	1300-Along Cross Result									4
										2
										5
2	1900-Along Cross Result									5
										4
										6
3	0100-Along Cross Result									6
										3
										6
3	0700-Along Cross Result	38	N off	140	29 0	N	South	8	N	10
		6			29	340				9
		39	349							14
3	1300-Along Cross Result									9
										10
										13
3	1900-Along Cross Result									7
										9
										11
4	0100-Along Cross Result									5
										9
										10
4	0700-Along Cross Result	17	N on	140	23 0	N	no observation			3
		3			23	340				7
		17	329							8
4	1300-Along Cross Result									23
										4
										23
4	1900-Along Cross Result									331
										20
										5
										21
5	0100-Along Cross Result									147
										71
										26
5	0700-Along Cross Result	152	S on	140	122 24	S on	North	75	S	87
		53			124	171				31
		161	179							92
5	1300-Along Cross Result									99
										26
										102
5	1900-Along Cross Result									145
										95
										26
										145
										98

KEY = All speeds in cm/sec

N = Northward, Shore parallel

S = Southward, Shore parallel

on = onshore off = offshore

Table 4: Current Data (Continued)
Oct 1992

Alongshore Cross-shore Resultant Time Day	Pier Measurements						Beach Measurements			Current Meter		
	Dye at (579 m) (surface)		Distance from Baseline (m)		(500m Updrift)		Dye 12m offshore (surface)		Location		Speed	Dir
	Speed	Dir			Speed	Dir			Speed	Dir		
6 0100-Along Cross Result											70	S
6 0700-Along Cross Result	61	S on	140		61	S on					12	off
6 1300-Along Cross Result	15				64						71	150
6 1900-Along Cross Result	63	174			177							
7 0100-Along Cross Result											60	S
7 0700-Along Cross Result											4	off
7 1300-Along Cross Result											60	156
7 1900-Along Cross Result											50	S
8 0100-Along Cross Result											5	off
8 0700-Along Cross Result											50	154
8 1300-Along Cross Result	0		140		3	N on					26	S
8 1900-Along Cross Result	10		250		2						1	on
9 0100-Along Cross Result	10				3	309					26	162
9 0700-Along Cross Result	28	N									30	S
9 1300-Along Cross Result	0		140		87	N					0	
9 1900-Along Cross Result	28	340			0						30	160
10 0100-Along Cross Result					87						17	S
10 0700-Along Cross Result					340						1	off
10 1300-Along Cross Result											17	157
10 1900-Along Cross Result											22	S
											0	
											22	160
											10	S
											6	on
											11	189
											10	S
											4	on
											10	184
											0	
											8	
											8	on
											3	S
											11	on
											12	234
											3	N
											12	on
											12	264
											2	S
											11	on
											11	242
											8	N
											13	on
											16	281
											9	N
											14	on
											16	282
											11	N
											11	on
											15	295
											6	N
											8	on
											10	286
											13	N
											9	on
											15	305
											3	S
											7	on
											7	229

KEY = All speeds in cm/sec

N = Northward, Shore parallel

S = Southward, Shore parallel

on = onshore off = offshore

Table 4: Current Data (Continued)
Oct 1992

Alongshore Cross-shore Resultant Time Day	Pier Measurements				Beach Measurements				Current Meter		
	Dye at (579 m) (surface)	Distance from Baseline (m)	Dye at Mid-Surf Zone (surface)	(500m Updrift)	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519	Speed	Dir
11 0100-Along Cross Result									3	S	
11 0700-Along Cross Result	8 10 13	S on 211	140	61 0 61	N 340	South	9	N	9 9 9	on 232 254	
11 1300-Along Cross Result									2 5 5	N on 272	
11 1900-Along Cross Result									3 4 5	N on 283	
12 0100-Along Cross Result									8 1 8	S on 169	
12 0700-Along Cross Result	25 5 26	S off 149	140	51 5 51	S off 154	North	30	S	17 0 17	S 160	
12 1300-Along Cross Result									16 0 16	S 160	
12 1900-Along Cross Result									5 3 5	S on 193	
13 0100-Along Cross Result									2 3 3	S on 217	
13 0700-Along Cross Result	24 10 26	N off 2	140	6 6 8	N off 25	South	5	N	9 7 11	N on 302	
13 1300-Along Cross Result									7 5 8	N on 308	
13 1900-Along Cross Result									2 5 6	N on 273	
14 0100-Along Cross Result									4 3 5	S on 196	
14 0700-Along Cross Result	15 4 16	N off 354	140	14 6 15	N off 2	South	8	N	5 3 5	N on 309	
14 1300-Along Cross Result											
14 1900-Along Cross Result									0 6 6	on 250	
15 0100-Along Cross Result									2 5 6	S on 227	
15 0700-Along Cross Result	32 8 33	N off 354	140	15 9 17	N off 11	South	8	N	7 6 9	N on 301	
15 1300-Along Cross Result									9 5 10	N on 308	
15 1900-Along Cross Result									14 8 16	N on 312	

KEY = All speeds in cm/sec
 N = Northward, Shore parallel
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 on = onshore off = offshore

Table 4: Current Data (Continued)
Oct 1992

Alongshore Cross-shore Resultant Time Day	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter	
	Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface)		Distance from Baseline (m)		Dye 12m offshore (surface)		Location	Speed	Dir
	Speed	Dir	Speed	Dir	Speed	Dir	Speed	Dir		0.9 km Offshore Depth -5.6m (NGVD) ID #519	
16 0100-Along Cross Result										6	N
										3	on
										7	312
16 0700-Along Cross Result	32 8 33	N off 354		12 3 13	N off 354				South	16 4 16	N on 325
16 1300-Along Cross Result										8 5 9	N on 309
16 1900-Along Cross Result										16 5 17	N on 322
17 0100-Along Cross Result										6 5 7	N on 301
17 0700-Along Cross Result	76 19 79	S on 174		102 0 102	S off 160				North	27 8 28	S off 143
17 1300-Along Cross Result										45 14 47	S off 143
17 1900-Along Cross Result										34 10 36	S off 144
18 0100-Along Cross Result										26 9 28	S off 140
18 0700-Along Cross Result	23 7 24	S on 177		68 20 71	S on 177				North	17 8 19	S off 134
18 1300-Along Cross Result										20 9 22	S off 137
18 1900-Along Cross Result										33 11 34	S off 142
19 0100-Along Cross Result										35 10 36	S off 144
19 0700-Along Cross Result	41 0 41	S off 160		55 28 62	S off 133				North	29 10 31	S off 140
19 1300-Along Cross Result										43 13 45	S off 144
19 1900-Along Cross Result										43 12 44	S off 144
20 0100-Along Cross Result										37 11 39	S off 143
20 0700-Along Cross Result	27 0 27	S off 160		102 0 102	S off 160				North	31 10 33	S off 143
20 1300-Along Cross Result										21 10 24	S off 134
20 1900-Along Cross Result										23 9 24	S off 139

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N = Northward, Shore parallel
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on = onshore off = offshore

Table 4: Current Data (Continued)
Oct 1992

Alongshore Cross-shore Resultant ---- Time	Pier Measurements				Beach Measurements				Current Meter	
	Dye at (579 m) (surface)		Distance from Baseline (m)		Dye 12m offshore (surface)		(500m Updrift)		0.9 km Offshore Depth -5.6m (NGVD) ID #519	
Day	Speed	Dir	Speed	Dir	Location	Speed	Dir	Speed	Dir	
21 0100-Along Cross Result								3	N	
								5	on	
								6	281	
21 0700-Along Cross Result	28	N	24	N				16	N	
	7	off	49	off				7	on	
	29	354	55	43	South	24	N	17	317	
21 1300-Along Cross Result								30	N	
								15	on	
								15	314	
21 1900-Along Cross Result								15	N	
								7	on	
								16	314	
22 0100-Along Cross Result								13	N	
								4	on	
								13	322	
22 0700-Along Cross Result	47	S	68	S				29	S	
	0		0					15	off	
	47	160	68	160	North	43	S	32	133	
22 1300-Along Cross Result								32	S	
								12	off	
								34	139	
22 1900-Along Cross Result								30	S	
								11	off	
								32	139	
23 0100-Along Cross Result								25	S	
								9	off	
								27	141	
23 0700-Along Cross Result	17	S	76	S				24	S	
	8	on	0					10	off	
	19	187	76	160	North	55	S	26	137	
23 1300-Along Cross Result								13	S	
								6	off	
								14	135	
23 1900-Along Cross Result								16	S	
								7	off	
								17	137	
24 0100-Along Cross Result								9	S	
								5	off	
								10	132	
24 0700-Along Cross Result	4	N	32	N				5	S	
	5	off	16	off				1		
	7	31	36	7	South	20	N	5	160	
24 1300-Along Cross Result								18	N	
								9	on	
								20	314	
24 1900-Along Cross Result								20	N	
								4	on	
								21	330	
25 0100-Along Cross Result								22	N	
								6	on	
								23	326	
25 0700-Along Cross Result	51	S	68	S				18	S	
	25	on	17	on				8	off	
	57	187	70	174	North	56	S	20	135	
25 1300-Along Cross Result								29	S	
								10	off	
								31	141	
25 1900-Along Cross Result								22	S	
								8	off	
								24	140	

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Table 4: Current Data (Continued)
Oct 1992

Alongshore Cross-shore Resultant ---- Time	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter	
	Dye at (579 m) (surface)		Distance from Baseline (m)	Dye 12m offshore (surface)			Location	Speed	Dir	Speed	Dir
Day	Speed	Dir		Speed	Dir	Speed					
26 0100-Along Cross Result										0.9 km Offshore Depth -5.6m (NGVD) ID #519	
26 0700-Along Cross Result	17 4 18	S off 146	152	68 17 70	S on 174		North	22	S	22 7 23	
26 1300-Along Cross Result										13 5 14	
26 1900-Along Cross Result										8 2 8	
27 0100-Along Cross Result										13 N 3 13	
27 0700-Along Cross Result	23 9 25	N off 2	140	0 5 5		0	South	0		15 8 17	
27 1300-Along Cross Result										21 5 21	
27 1900-Along Cross Result										7 1 7	
28 0100-Along Cross Result										5 2 5	
28 0700-Along Cross Result	8 4 9	N off 7	140	0 0 0			South	3	S	14 6 15	
28 1300-Along Cross Result										1 2 2	
28 1900-Along Cross Result										106 S 3 6	
29 0100-Along Cross Result										129 S 5 8	
29 0700-Along Cross Result	9 2 9	S on 174	140	6 1 6	S on 174		North	8	N	14 9 17	
29 1300-Along Cross Result										7 1 7	
29 1900-Along Cross Result										123 S 2 12	
30 0100-Along Cross Result										126 S 5 8	
30 0700-Along Cross Result	8 0 8	S on 160	140	11 3 12	N on 326		South	5	S	11 5 12	
30 1300-Along Cross Result										134 S 6 13	
30 1900-Along Cross Result										137 S 5 9	

KEY = All speeds in cm/sec

N = Northward, Shore parallel

S = Southward, Shore parallel

on = onshore off = offshore

Table 4: Current Data (Concluded)
Oct 1992

Alongshore Cross-shore Resultant ---- Time Day	Pier Measurements						Beach Measurements			Current Meter	
	Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	0.9 km Offshore Depth -5.6m (NGVD) ID #519		
31 0100-Along Cross Result									23	S	
31 0700-Along Cross Result	28 14 31	S on 187	165	68 27 73	S on 182	North	24	S	30 12 32	S off 139	
31 1300-Along Cross Result									41 14 43	S off 141	
31 1900-Along Cross Result									42 13 44	S off 143	

KEY = All speeds in cm/sec
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PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves) are taken daily at the seaward end of the pier. The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests at approximately the same location as the visual measurements. The pier axis (considered perpendicular to the beach at the FRF) is oriented 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are also taken daily at the seaward end of the pier. A Bucket Thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The temperature is then read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the depth of visibility.

Table 5: Supplemental Observations

Oct 1992

Day	Time	Wave Approach Angle at Pier End deg from True N		Radar Wave Angle deg from True N	Width of Surf Zone,m	Water Characteristics at Pier End		
		Primary	Secondary			Temp.,C	Density g/cc	Secchi Vis.,m
1	0804	50		60	123	19.3	1.0185	1.2
2	0800	50			96	19.0	1.0200	1.2
3	0851	80			59	19.0	1.0204	0.9
4	0853	85		90	94	19.9	1.0200	0.9
5	0825	50		50	576	19.0	1.0201	0.6
6	0816	60		60	577	17.3	1.0192	0.6
7	0800	65		inoperative	140	17.6	1.0216	0.6
8	0738	75		75	140	18.1	1.0220	0.9
9	0815	80		80	104	18.9	1.0221	0.9
10	0857	85			126	20.0	1.0223	0.9
11	0834	80			79	20.0	1.0225	1.5
12	0755	15			96	18.9	1.0228	1.2
13	0715	85			2	19.0	1.0227	0.9
14	0720	90			1	19.0	1.0226	1.2
15	0750	80	120		1	18.9	1.0235	0.9
16	0740	80	110		1	18.9	1.0237	1.5
17	0855	15		35	160	17.8	1.0240	0.6
18	0840	50		30	157	17.2	1.0240	0.9
19	0735	60		110	119	16.7	1.0237	1.5
20	0815	45		65	132	13.9	1.0223	0.9
21	0800	60	135		130	16.1	1.0221	0.9
22	0825	25		100	154	17.0	1.0229	0.9
23	0830	40		70	136	16.7	1.0234	1.5
24	0945	75			123	16.7	1.0230	1.5
25	0930	15	100	85	136	16.1	1.0233	0.9
26	0905	25		inoperative	99	15.6	1.0230	0.9
27	0830	95			1	16.1	1.0233	0.9
28	0850	35			10	16.7	1.0233	1.2
29	0900	100	15		2	17.2	1.0230	1.2
30	0915	90	10		1	17.8	1.0229	1.2
31	1050	30		50	171	16.1	1.0227	0.9

PART VI: WATER LEVELS

Since 1978, the National Oceanic and Atmospheric Administration (NOAA)/National Ocean Service (NOS) has operated a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect instantaneous water level data every 6 minutes throughout the month.

The variation in water level during the month is shown in Figure 4 along with a list of mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water level.

Table 6 contains the time at the center of each 12.42-hr tidal cycle and the range, high, low, and mean water levels during each tidal cycle.

FRF Tide Heights

Oct 1992

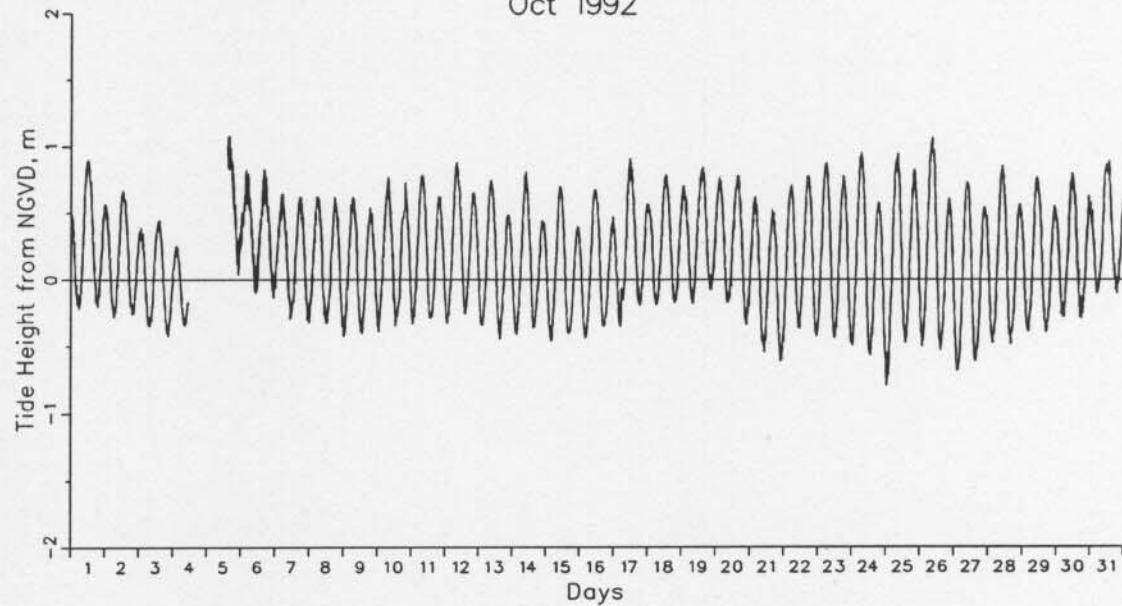


Figure 4. Water level time history

Monthly Water Levels,m NGVD

Extreme Low = -0.79 on day 24 at 2342 EST
Extreme High = 1.07 on day 26 at 730 EST
Monthly Mean = 0.17
Mean Low = -0.35
Mean High = 0.72
Mean Range = 1.07

Table 6: Water Levels, m NGVD

		Oct 1992			
Mid-Cycle Day	Time	Low	High	Mean	Range
1	648	-0.22	0.90	0.30	1.12
1	1913	-0.20	0.74	0.24	0.94
2	738	-0.28	0.67	0.17	0.95
2	2003	-0.26	0.56	0.11	0.82
3	828	-0.35	0.45	0.04	0.80
3	2054	-0.42	0.37	-0.05	0.80
4					
4		Gage Inoperative			
5					
5	2234	0.04	0.95	0.51	0.92
6	1100	-0.10	0.83	0.36	0.93
6	2325	-0.14	0.73	0.30	0.87
7	1150	-0.29	0.62	0.17	0.91
8	15	-0.32	0.62	0.17	0.94
8	1240	-0.33	0.62	0.13	0.95
9	106	-0.42	0.62	0.11	1.05
9	1331	-0.40	0.54	0.09	0.94
10	156	-0.39	0.77	0.17	1.16
10	1421	-0.34	0.73	0.17	1.07
11	246	-0.33	0.79	0.25	1.12
11	1512	-0.29	0.63	0.17	0.92
12	337	-0.33	0.88	0.24	1.21
12	1602	-0.26	0.66	0.24	0.92
13	427	-0.34	0.75	0.19	1.09
13	1652	-0.44	0.49	0.08	0.93
14	518	-0.41	0.81	0.16	1.22
14	1743	-0.36	0.44	0.08	0.80
15	608	-0.46	0.70	0.11	1.16
15	1833	-0.40	0.40	0.00	0.80
16	658	-0.43	0.68	0.11	1.11
16	1923	-0.35	0.47	0.05	0.82
17	749	-0.35	0.91	0.25	1.26
17	2014	-0.19	0.57	0.21	0.76
18	839	-0.19	0.79	0.28	0.97
18	2104	-0.17	0.71	0.26	0.88
19	929	-0.18	0.84	0.33	1.02
19	2155	-0.08	0.77	0.34	0.84
20	1020	-0.17	0.78	0.30	0.95
20	2245	-0.34	0.62	0.17	0.95
21	1110	-0.54	0.52	0.01	1.07
21	2335	-0.61	0.71	0.03	1.32
22	1201	-0.36	0.78	0.21	1.14
23	26	-0.42	0.87	0.21	1.30
23	1251	-0.43	0.78	0.19	1.21
24	116	-0.49	0.95	0.19	1.44
24	1341	-0.57	0.80	0.08	1.37
25	207	-0.79	0.95	0.05	1.74
25	1432	-0.47	0.83	0.21	1.30
26	257	-0.50	1.07	0.27	1.57
26	1522	-0.53	0.95	0.13	1.48
27	347	-0.68	0.73	0.00	1.41
27	1613	-0.61	0.59	0.01	1.20
28	438	-0.47	0.85	0.16	1.33
28	1703	-0.48	0.64	0.10	1.12
29	528	-0.39	0.77	0.17	1.16
29	1753	-0.39	0.58	0.11	0.97
30	619	-0.28	0.80	0.23	1.08
30	1844	-0.29	0.63	0.17	0.92
31	709	-0.10	0.89	0.36	0.99
31	1934	-0.10	0.79	0.27	0.89

PART VII: NEARSHORE PROFILES

- A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Geodimeter surveying system; a Geodimeter 140-T self-tracking, electronic theodolite, distance meter, in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in September 1992 and the survey in October 1992 on profile line 188, located 517 m south of the pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1992. Cross-hatched areas indicate changes to the annual envelope which occurred in October.

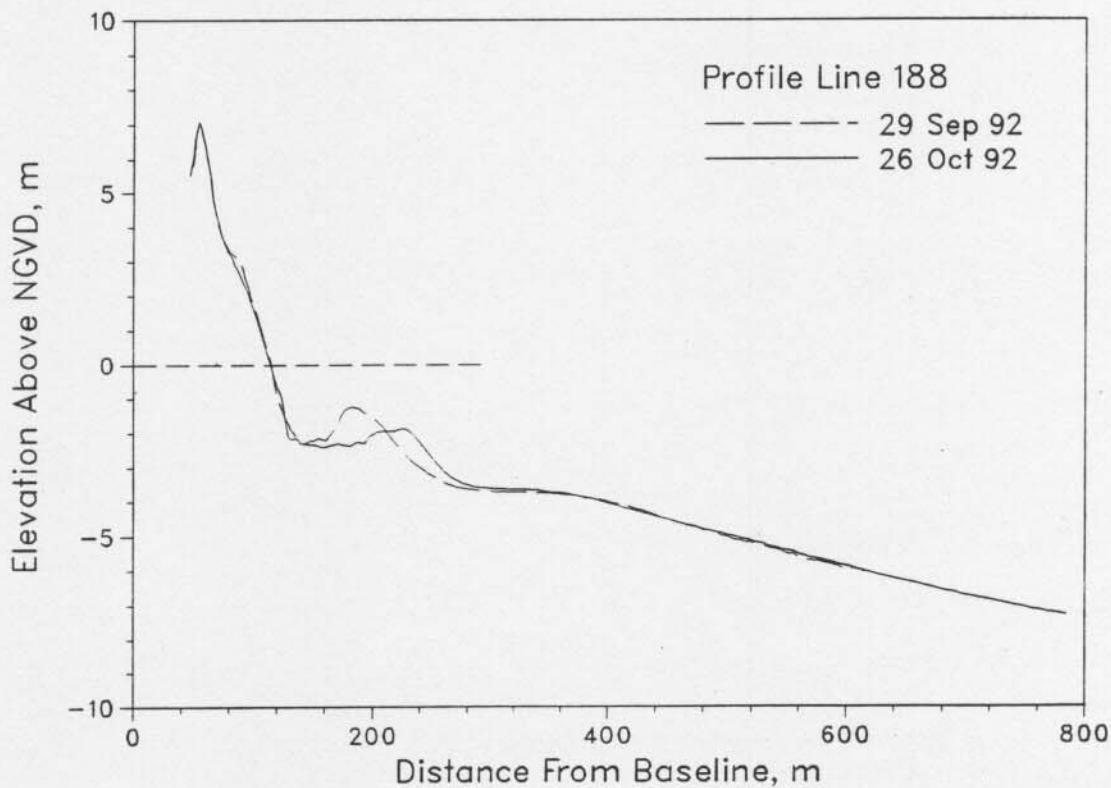


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

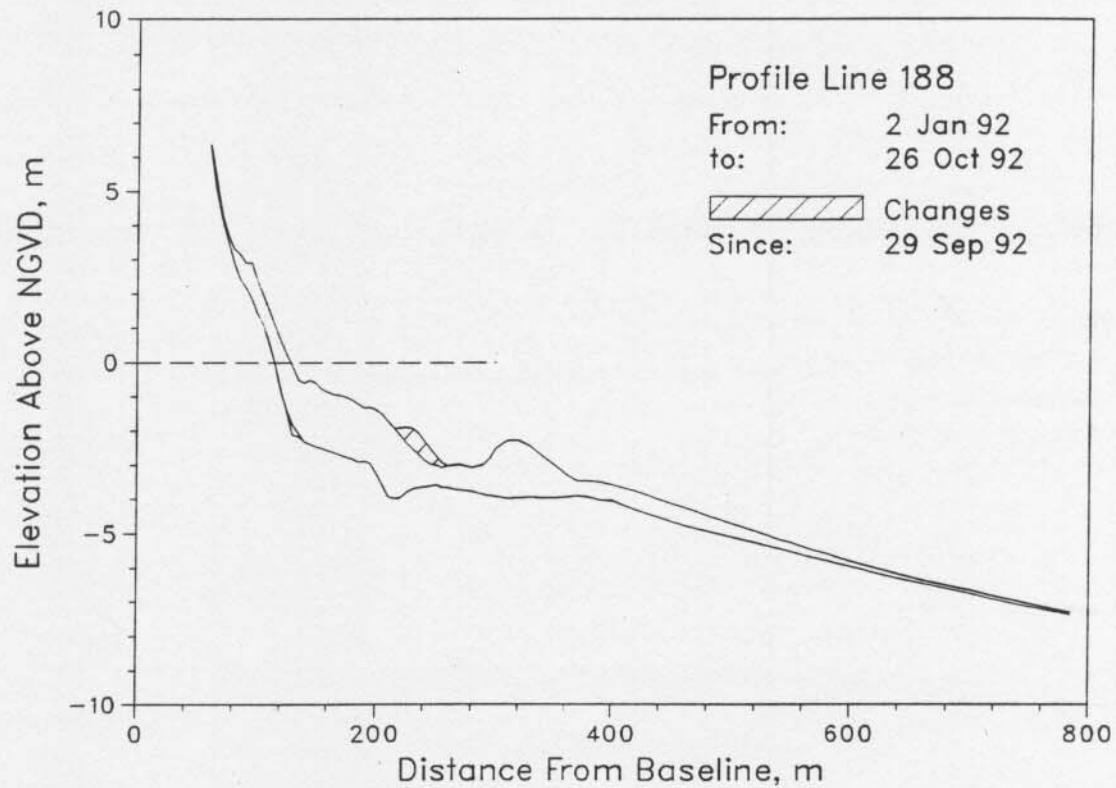


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey on 26 October. Wide contour lines on the change diagram represent eroded areas; thin lines indicate deposition.

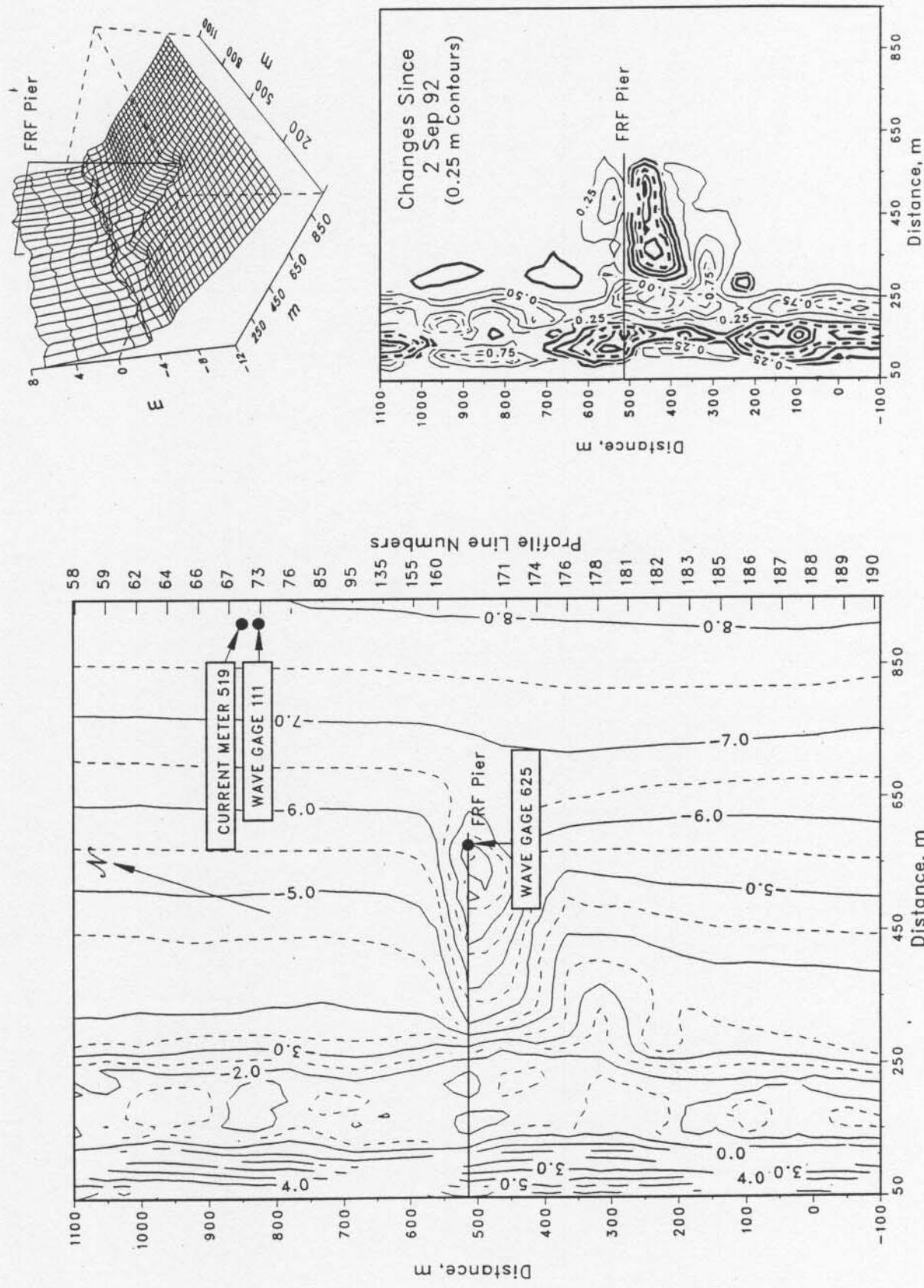


Figure 7. FRF bathymetry 26 Oct 92 depths relative to NGVD

PART VIII. SPECIAL EVENTS

- A. Storm Data Collection. The following list identifies times when the wave height H_{mo} at the seaward end of the pier (i.e. as measured near the end of the pier) exceeded 2 m.

<u>Start</u>	<u>End</u>
4 October (1934)	6 October (1142)

B. Storm Synopsis.

A low pressure system that was funneled northward from the Gulf of Mexico between two cold fronts, passed about 240 kms east of Cape Hatteras. The maximum H_{mo} (at gage 625) of 3.1 meters ($T_p = 10.2$ sec) was attained at 1216 EST on 5 October. Maximum winds (from northeast) reached 19.1 m/s on 5 October at 0734 EST. Atmospheric pressure was recorded at a low of 1004.5 mbs. There was 28 mm of precipitation.

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